Yankee Clipper Contest Club

Scuttlebutt

No. 66 December 1986

Captain's Cabin
Bill Santelmann, N1AU

Felt like old times, didn't it. A solar flux of 98 opening 15 meters, with even 10 meters open occasionally, made the CQ WW phone weekend a real treat. I hope you did well, and that you will remember to file your log on YCCC's behalf by the December 1 deadline.

Congratulations to Dick, AK1A, for the excellent service his packet system gave us during the contest. From my perspective at N1AU, at the far eastern end of the net, I saw as many as 17 stations connected simultaneously, from as far away as N2AA and passing spotting data accurately and rapidly. We at N1AU certainly benefited greatly from it. The connection to N2AA and K1KI is still quite shaky and requires many retries, consuming valuable net operating time. We really need a digipeater between AK1A and K1KI to secure this path. Any volunteers?

I see the YCCC developing into an effective contest team, one that will begin to win again (yes, we have won some). It is no longer a collection of isolated contesters who see each other only a few times a year at club meetings. A lot of factors have brought us together and built many firm friendships; the new six-meeting plan at Sturbridge developed by KM1C, the commuting FM ragchews, breakfast meetings, and the new YCCC packet net run by AK1A, which is on the air continuously, have all contributed. During contests, we can communicate with anyone else on the packet net in a way that does not distract. All in all it's been a good year for the YCCC. Have a great holiday season.

Next Meeting
Paul Young, K1XM

The next Yankee Clipper Contest Club meeting will be on Sunday, December 7, at the Sheraton Sturbridge, at 1:00 PM. Note that because of the HC8 DXpedition, KQ1F will **NOT** be making the reservation for lunch before the meeting. Bill, N1AU, will do it – contact him to make reservations. Bill will have to call in reservations by noon on Thursday. Contact him by phone (he has an answering machine) or by packet, or interrupt his JA run in the CQ WW. Lunch costs $8.50, which is deducted from the $100 cost to the club of the meeting room. The last lunch worked out very well. The food was simple, but of very high quality. The desserts, including carrot cake and cheesecake, were wonderful, worth $2.00 each in any restaurant, and you can (I did) have more than one!

The Sheraton Sturbridge Resort and Conference Center is located on Route 20 in Sturbridge, Massachusetts, $\frac{1}{2}$ mile West of I-84 (first exit off I-84 when coming South from the Mass. Turnpike). Directions to the Sheraton are easy: Exit I-84 on to Route 20 West. You will pass through two sets of stoplights while noticing several motels on your right. Make a right turn just prior to the Burger King sign. This is

the entrance to the Sheraton, and there is plenty of parking in front of the hotel.

The meeting dates have been set for the rest of 1986/1987 and are as follows:

DATE	DAY	DELI-LUNCH
December 7, 1986	Sunday	11:30 AM
February 7, 1987	Saturday	11:30 AM
April 5, 1987	Sunday	11:30 AM
June 6, 1987	Saturday	11:30 AM
August 2, 1987	Sunday	Lakeside Bar-B-Que
October 3, 1987	Saturday	11:30 AM
December 6, 1987	Sunday	11:30 AM

Floating
Paul Young, K1XM

Things have been real busy here the last few weeks. As you may notice, the **Butt** is early for a change. That's because I had to get it out before I left for HC8. Packing for the trip, making arrangements, wiring money to Quito, and making antennas have not left me enough time for contesting. I hope the CQ WW CW will fix that!

It looks like we will be using the call HC8A. There is a possibility of a third operator, KB2HE, who will be on Galapagos during the contest. Remember to work us once per band, and if you hear us in a European pile-up, don't hesitate to call us (with your beam aimed at Europe of course).

We will also put in some time before and after the contest. I will try to accommodate any club members who need HC8. My SB-200 delivers 600 watts output on 160 meters; if you need it find me on another band and make a sked.

I hope conditions on CW are as good as on phone!

Secretary's Report
Yankee Clipper Contest Club

The October YCCC meeting was held at the Boxboro ARRL New England Division Convention on 18 October 1986 with 98 members and at least 15 guests in attendance.

The club President, Bill, N1AU, called the meeting to order at 1pm, and gave an introduction to the club to the guests and non-members in attendance. This was followed by introductions all the way around the room. Two members had good news to report: Ed, KA2MXO, is now NT2X, and Steven, KA2ZPD (son of K5NA), passed his General Class exam that morning. The introductions were followed by comic relief courtesy of Rick, K2WR, and Doug, K1DG.

The Treasurer's report was read and accepted, and the Secretary's report was waived (since it was published in **Scuttlebutt** 65). Bill, KM1C, has had to resign as Area Manager for the NH/VT area due to work pressures. Any member in New Hampshire or Vermont who can take over as Area Manager should contact Bill, KM1C, or Bill, N1AU.

Contest log sheets, dupe sheets, multiplier sheets, exchange newsletters, contest summary sheets, QSO breakdown sheets, and **Contest Cookbooks** for members and subscribers (only!) were available on the back table. We found out later that some of the **Contest Cookbooks** were picked up by non-members and other visitors. The remaining ones have been mailed out. Any member or paying subscriber whose copy did not appear in the mail should contact Paul, K1XM, or Charlotte, KQ1F, for a replacement copy.

Doug, K1DG, presented a commercial for the "Eimac Express Card". Don't leave home without it!

Dick, AK1A, presented his packet radio cluster system.

Paul, K1XM, gave out the first annual **Scuttlebutt** Editor's Awards to the following members:

AK1A	K1GQ	W1WEF
K1AR	KY1H	KA1X
KM1C	K1KI	K1XM
W1CWU	AK1L	K2TR
K1EA	W1PH	NT2X
KC1F	K1RX	K5NA
KQ1F	K1VR	WB8BTH
W1FJ	KB1W	

Rich, K2WR, presented a commercial for Crazy Freddy's Field Day Sale.

The club welcomed, in several batches, a total of sixteen new members:

Mac McGrath	KZ1A
Shawn McCormick	NC1B
Bruce Blain	K1BG
Lester Kemble	KG1D
James R. Henderson	N1DEA
Lawrence D. Savoy	KX1F
Robert B. Weinstock	KN1K
Bob McCormick	KA1KPH
John F. Corini	KA1MDG
Steve Tolf	K1ST
Michael McCarthy	WA1UAR
George Smith	KA1VC
Robert Halprin	K1XA
Bob Shaw	WA2CNF
Rus Healy	NJ2L
Gerry Hull	AK4L/VE1RM

Following this, K2WR and K1DG previewed the CQ WW.

The hour-long business meeting was followed by three hours of technical and general-interest seminars: Bill,

K1GQ, spoke on 80m loop antennas. John, W1RR, spoke about computer modeling of Yagi antennas. Bill, N1CQ, lectured on tower installation safety considerations. Paul, K1XM, showed slides from the 1985 HC8X CQWW SSB multi-multi DXpedition, which took first place in the world for multi-multis. Mark, K1RX, showed slides from the 1985 VP2VCW CQWW SSB multi-multi DXpedition, which closely followed HC8X in second place for the world in multi-multis. Jeff, WB8BTH, showed slides of his 1981 expedition to VP5 for the ARRL DX SSB.

During N1CQ's lecture, Fred, K1VR, and John, W1FV, were speaking in a different lecture room on antennas for 40, 80, and 160m, including slides of several member's stations and arrays.

All these seminars wrapped up at 4pm, and the members adjourned to the bar, the banquet, or the local Chinese restaurant, depending on their hunger and thirst levels.

Respectfully submitted,
Charlotte L. Richardson, KQ1F
Secretary/Treasurer
20 October 1986

TS-940S Phase Noise Improvements
John Kaufmann, W1FV

The phase noise (or reciprocal mixing noise) performance of the Kenwood TS-940S has come under considerable scrutiny recently. At least partially in response to popular demand, Kenwood has devised a modification, described in their service bulletin 911, which purportedly improves this aspect of '940 performance. Also, more than one year ago, a modification developed by Lowe Electronics in England was reported to produce substantial phase noise reduction ("Trio TS-940S Multimode Transceiver", A. McKenzie, G3OSS, **Amateur Radio**, July, 1985, p. 23. A schematic of this modification was reproduced in the last issue of the **Scuttlebutt** in K1GQ's article "TS-940S Performance – Part 2", but unfortunately there are errors in the component values given there. See the conclusion of this article for corrections.).

I have tried both of these modifications in my TS-940S and in this article I will report the results of detailed laboratory measurements on the radio for both transmit and receive with each of the modifications. This data will reveal which of the two yields better performance. The large improvement which is measured should be of interest to all owners or would-be owners of the TS-940S.

Measurement Set-Up

I was fortunate to have access to state-of-the-art test equipment for performing the required measurements. Transmitter measurements were performed by operating key-down CW at rated output (about 100 watts) into a 50Ω dummy load and recording spectral data on a Hewlett-Packard 8566A spectrum analyzer. Receiver data was taken with a HP 8642B signal generator feeding a very clean 14200 kHz signal into the antenna port of the TS-940S and a HP 3456A digital voltmeter measuring receiver audio output. The receiver was set up with the AGC off, CW filters in (IRI 400 Hz filters), CW VBT off, and the audio filter out. My TS-940S was also the same unit measured earlier in stock form by K1GQ and written up in the article "Should I Buy a TS-940S?" in **Scuttlebutt** no. 62, March, 1986, also reprinted by **The DX Bulletin**.

Receiver Measurements

The signal generator output was adjusted to a level of -43.0 dBM to produce a S9+30 dB signal on 14200 kHz (this is the same input level used in the K1GQ measurements to allow comparison with those earlier results). Receiver reciprocal mixing noise output at audio was measured as a function of frequency offset from 14200 kHz.

Results for the stock radio, the Lowe modification, and the Kenwood bulletin 911 modification are shown in Figs. 1, 2, and 3 respectively. (The eagle-eyed reader may notice that Fig. 1 appears coarser and less "detailed" than the other two plots. This is because fewer data points were taken in this earlier measurement but the conclusions to follow are not altered by this fact.) The Fig. 1 measurement is essentially a duplication of the K1GQ data but taken on the laboratory test setup and is found to exhibit good agreement with Bill's previous results.

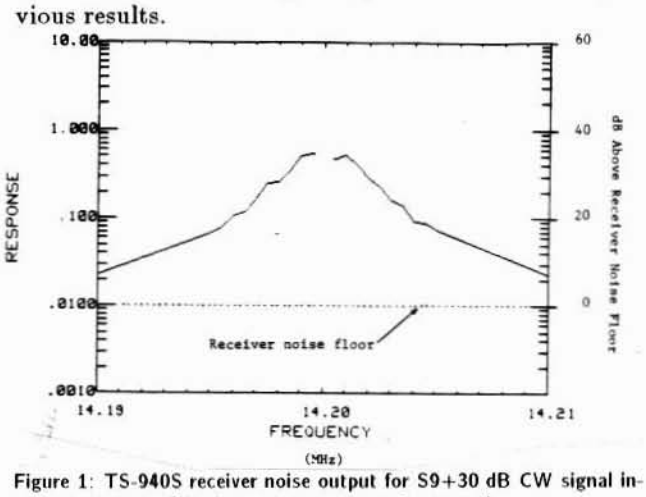

Figure 1: TS-940S receiver noise output for S9+30 dB CW signal input; stock form. (No data taken at center frequency).

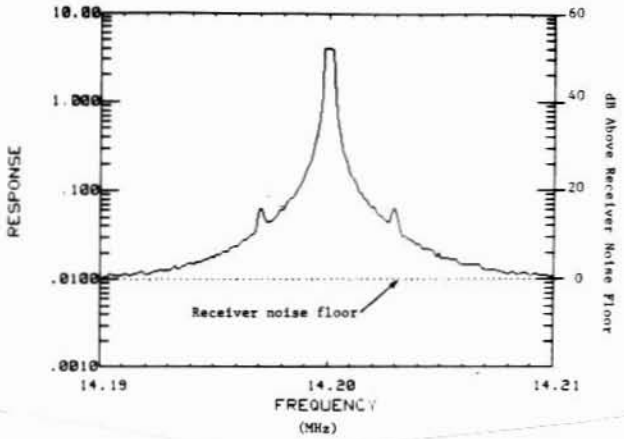

Figure 2: TS-940S receiver noise output for S9+30 dB CW signal input; Lowe modification.

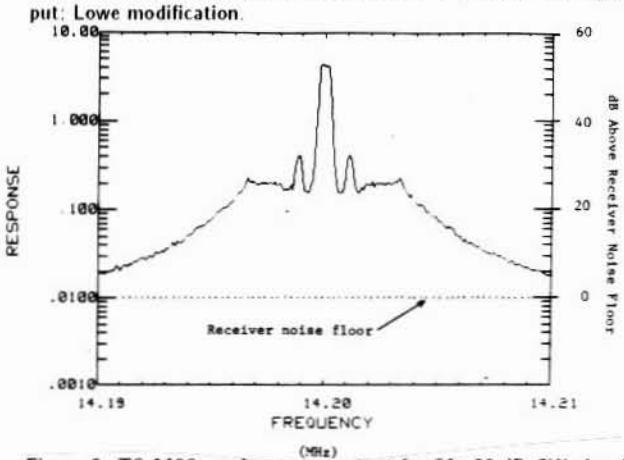

Figure 3: TS-940S receiver noise output for S9+30 dB CW signal input; Kenwood modification.

Fig. 3 indicates two relatively large discrete sidebands approximately 1 kHz each side of center. In on-the-air use, these are quite audible on all strong signals. Two relatively weak "spurs" are also visible in Fig. 2 ± 3 kHz from center. Neither of these responses appears in the stock '940 data. It is not clear whether they are a result of the modifications or whether they were present originally but were masked by higher levels of reciprocal mixing noise in the unmodified radio. The flat-topping of the output at the center frequency in Figs. 2 and 3 is due to receiver saturation which is unavoidable with the AGC off once the signal falls inside the receiver filter passband. It should also be pointed out that the reciprocal mixing noise output which is observed will vary in direct proportion to the strength of the received signal. Increasing (or decreasing) the input signal by 10 dB, for example, will increase (or decrease) the noise by 10 dB.

Table I summarizes the receiver performance for the stock unit, and the Lowe and Kenwood modifications by comparing the noise levels at 1 kHz increments from the center frequency. The Lowe modification comes out on top by a large margin. Reciprocal mixing noise is reduced by 12-13 dB inside ± 5 kHz, almost exactly the improvement which has been claimed. The main effect of the Kenwood modification is to introduce a "plateau" in the noise spectrum inside ± 3 kHz or so. Outside this range it appears to be as noisy as a stock '940.

Table I
Receiver Noise Output for S9+30 dB CW Signal Input
(dB Above Receiver Noise Floor)

frequency offset	stock	Lowe mod.	Kenwood mod.
1 kHz	34 dB	23	30 (spur)
2	28	15	26
3	24	15 (spur)	26
4	20	7	22
5	17	4	18
10	7	0	5

In on-the-air operation there are no apparent problems with regard to synthesizer lock-up time or tuning glitches as a result of either modification. The modified '940 tunes just like the stock '940.

There have been reports of synthesizer switching problems in modified '940s in the QSK mode, in particular, in split frequency operation across adjacent 10 kHz sectors. It turns out that this problem has been documented as existing in even the stock '940 (see **International Radio** Kenwood Newsletter 66, June, 1986, "Kenwood Solves TS-940S Split Dot Problem") and therefore does not appear to be a modification-related effect.

Transmitter Measurements

Transmitter phase noise output was measured over two ranges: ± 5 kHz and ± 100 kHz from center. The close-in noise is of particular concern from the standpoint of potential adjacent-channel interference when transmitting. Figs. 4, 5, and 6 compare the output of the TS-940S transmitter over the close-in range in stock form, and with the Lowe and Kenwood modifications respectively. (Note that the levels of noise measured depend upon the measurement bandwidth of the spectrum analyzer. Here the noise was measured in a 100 Hz bandwidth. Thus the levels indicated correspond to what one would observe listening to the transmit signal in a receiver with a 100 Hz filter passband. The measured noise will increase with greater bandwidth – by 10 dB, for example, if the measurement bandwidth is 1 kHz. To obtain an approximate conversion of the noise spectrum measured here to the often-used engineering units of dBC/Hz, subtract 20 dB from the levels shown.)

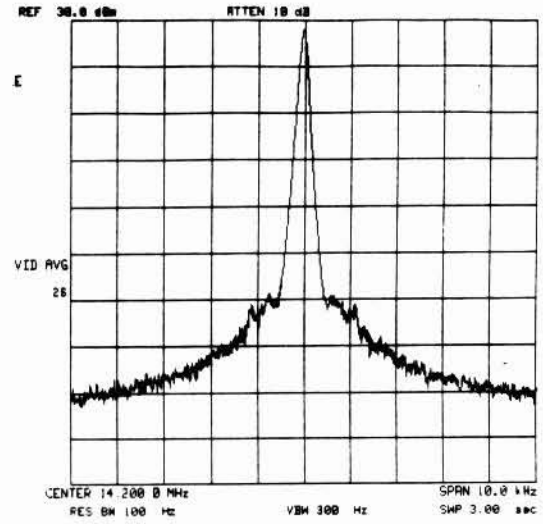

Figure 4: TS-940S transmitter noise output at 14200±5 kHz; stock form. (Horizontal axis = frequency, 1 kHz per division; Vertical axis = output measured in 100 Hz bandwidth, 10 dB per division).

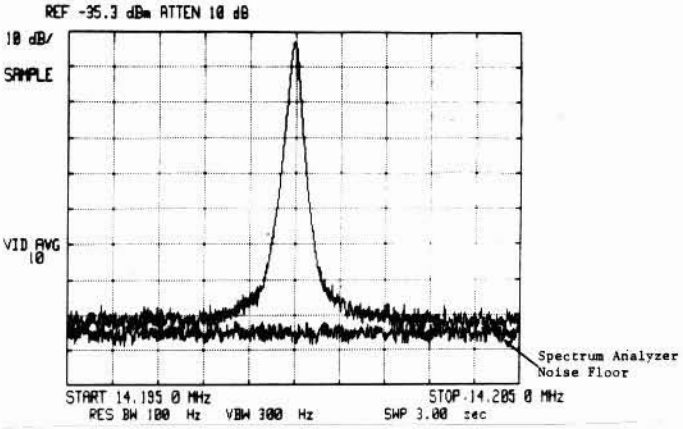

Figure 5: TS-940S transmitter noise output at 14200 kHz ±5 kHz; Lowe modification. (Horizontal axis = frequency, 1 kHz per division; Vertical axis = output measured in 100 Hz bandwidth, 10 dB per division).

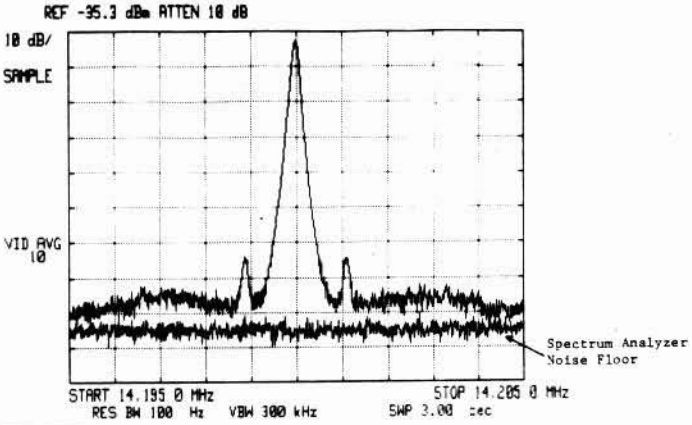

Figure 6: TS-940S transmitter noise output at 14200 kHz ±5 kHz; Kenwood modification. (Horizontal axis = frequency, 1 kHz per division; Vertical axis = output measured in 100 Hz bandwidth, 10 dB per division).

Both modifications produce a significant noise reduction in close to the carrier. The Kenwood modification (Fig. 6) exhibits two "spurs" in exactly the same place as the receiver did, ± 1 kHz from center. These same "spurs" appear to be just visible in the stock '940 plot (Fig. 4), but are almost obscured by higher levels of phase noise. Potentially these undesired responses can be quite offensive to others during transmit and can also result in significant out-of-band emission if one crowds the band edges. In the case of the Lowe-modified TS-940S (Fig. 5), the discrete sidebands observed in the receiver response are absent from the transmitter spectrum.

It is evident that the greatest clean-up of the transmit signal occurs only inside ± 2 kHz or so for both modifications. Out at ± 5 kHz, the modified transmitters perform only about the same as stock, although the measured responses out there are seen to begin encroaching upon the noise floor of the spectrum analyzer.

Fig. 7 shows the transmitter output over ± 100 kHz for the Lowe TS-940S. (Here the measurement bandwidth is 1 kHz. Subtract 30 dB from the indicated noise spectrum to obtain an approximate conversion to dBC/Hz). The plots for the other versions looked almost identical to Fig. 7 and, therefore, are omitted here. Although the transmitted noise decreases with increasing frequency offset, the levels cannot be considered negligible. Locals will probably be bothered by the noise around your S9+50 dB signal on a quiet band.

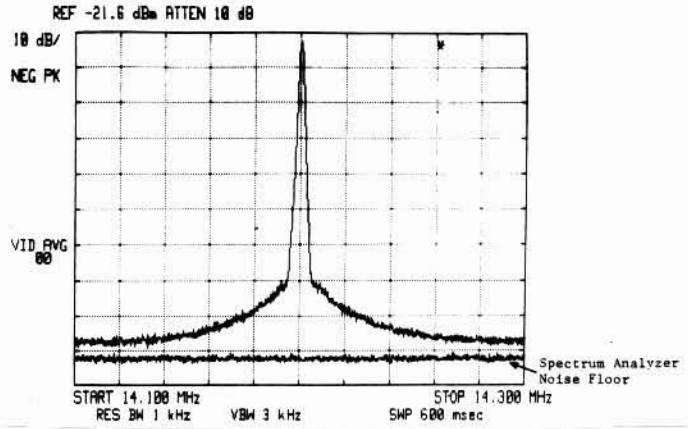

Figure 7: TS-940S transmitter noise output at 14200 kHz ± 100 kHz; Lowe modification. (Horizontal axis = frequency, 200 kHz per division; Vertical axis = output measured in 1 kHz bandwidth, 10 dB per division).

Table II summarizes the transmitter performance of the various units. Once again, the Lowe-modified TS-940S is equal or superior to the others, although the improvements over stock are not as dramatic overall as the receiver improvements.

Table II
Transmitter Noise Output with Respect to Carrier
in 100 Hz Bandwidth

frequency offset	stock	Lowe mod.	Kenwood mod.
1 kHz	-62 dB	-74	-72
2	-71	-78	-74
3	-75	-79	-73
4	-77	-80	-74
5	-79	-80	-78

Discussion and Conclusion

The Lowe modification of the TS-940S is the clear winner for both transmit and receive. The Kenwood modification falls short of yielding improvements "...on the order of 15 dB within the range of ± 20 kHz..." as claimed in their service bulletin, at least in my '940. I was sufficiently disappointed by the results for the Kenwood modification that I double-checked my modification work but could find no flaws. Nonetheless it still represents an improvement over the stock TS-940S and is definitely a step in the right direction by Kenwood.

A few words on implementing the Lowe modification; as mentioned up front, there are some errors in the schematic provided previously by K1GQ. In the VC1 line from the PLL board, the values for R2 and C2 should be 1000Ω and 0.022 μF respectively, and in the VC2 line, C2 should be 0.047 μF. One must also be careful about component layout in attempting to install the additional circuitry. Any stray pickup of 60 Hz or other noise onto the signal lines involved can severely degrade the synthesizer noise performance as I discovered in my first somewhat haphazard installation of this modification. All component leads should be as short and as direct as possible. I mounted everything on a small PC board just alongside the RF board (X44-1660-00) near the socket where the VC1 and VC2 lines connect via a 4-pin plug.

In actual use, the receiver improvements with the Lowe modification can almost be considered dramatic in some instances. The "hash" produced by strong signals is strikingly reduced, often to the point of being imperceptible. It is now much easier to copy weak signals in close to strong ones, provided the strong signals are themselves spectrally clean. In terms of receiver phase noise performance, the modified TS-940S now probably ranks among the best of the current crop of frequency-synthesized rigs, but still falls short of equaling the better non-synthesized radios such as the older Drake C-Line or Collins S-Line.

The transmitter performance is significantly improved, too, but principally at close-in frequencies only. Based on data published for the TS-930S ("Trio TS-930S and TS-940S HF Transceivers", P. Hart, G3SJX, **Radio Communication**, May, 1986, P. 328, also discussed by K1GQ in the last issue of the **Scuttlebutt**), the '930 transmitter appears to be substantially cleaner than the modified '940.

I strongly recommend the Lowe modification to all TS-940S owners.

Acknowledgments

Thanks go to my colleagues Dave Cipolle, WA1UGE, and Steve Alexander (no call), of MIT Lincoln Laboratories for help in carrying out the lab measurements. Also, useful discussions with Bill Myers, K1GQ, and Don Nelsen, NB1Y, are gratefully acknowledged.

TS-940S Circuit Schematic Errors in the Phase-Lock Loop Section

Don Nelsen, NB1Y

There are several errors in the circuit schematic both in the TS-940S Service Manual and in the Service Bulletin No 911 entitled, "TS-940S VCO Carrier to Noise Ratio Improvement." Fortunately, the errors do not affect the implementation of the 911 modification. Furthermore, the errors are in the circuit schematic only and not in the PC board etch pattern.

I report these corrections here because there is now much concern over obtaining a modification to the PLL design that will reduce the reciprocal mixer noise. In attempting to analyze the PLL dynamics, I quickly found that parts of the loop would not work at all as configured in the Service Manual schematic (on p. 96). Upon checking the PC etch diagram for the PLL on page 97 of the Service Manual, the circuit was found to be transcribed incorrectly in several places in the vicinity of the phase-lock loop operational amplifiers (IC18).

Figure 1 shows the relevant part of the schematic as it appears on page 96 of the Service Manual, and in the Service Bulletin 911. The corrected version of the schematic is shown in Fig 2.

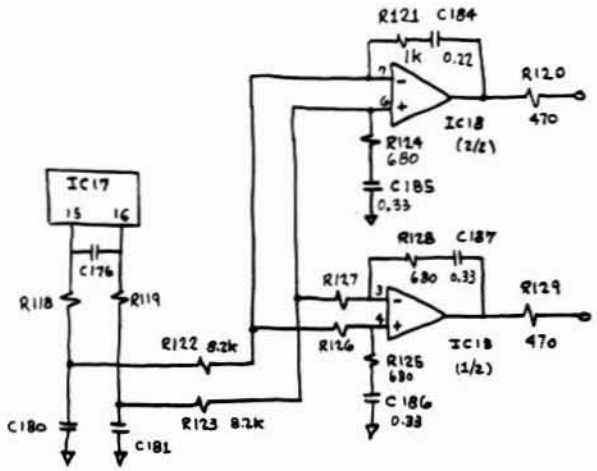

Figure 1. Section of PLL schematic as it appears in the Service Manual and in Bulletin 911.

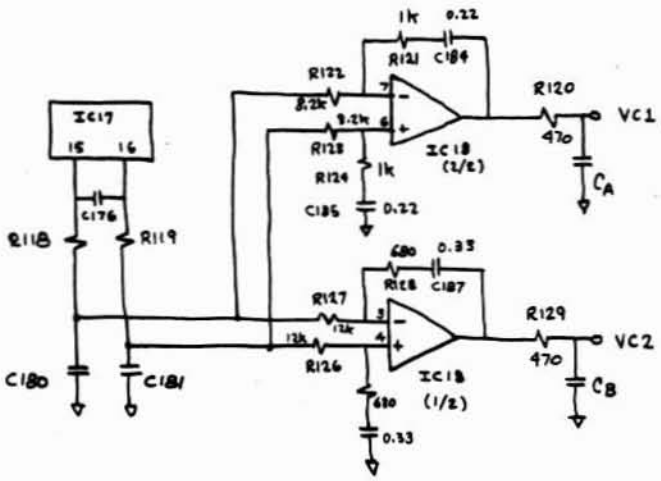

Figure 2. Corrected version of circuit schematic.

The corrections were:

- Resistors R126, R127, R122, and R123 need to be rearranged. Presently the virtual zero voltage across the input of the upper op amp IC18 (2/2) shorts out the signal to the lower op amp (1/2). Also, the polarity of amplification of the lower opamp is reversed.

  The Fix: The left end of R126 should be connected to the top of C181 (where C181 intersects R119). The left end of R127 should be connected to the top of C180 (where C180 intersects R118).

  Now both the above problems will be corrected and the resistor placement will correspond to that of the PC etch pattern.

- The values of C185 and R124 were transcribed incorrectly. C185 should be the same as C184 (0.22 μF), and R124 should be the same as R121 (1kΩ). These corrected values correspond to those shown in the parts list in the Service Manual, and are what one would expect for a balanced differential design.

The Phase Noise Modification of Bulletin 911: the modification described is (i) to remove C176, C180, and C181; (ii) to change R120 and R121 to 1kΩ from 470Ω, and (iii) to add 0.01 μF capacitors identified as CA and CB in Figure 2.

As can be seen, the implementation of this modification is not affected by the three schematic errors.

I expect these discrepancies would have been obvious to those who have already analyzed the loop dynamics in detail. However, to save others the problem of recorrecting the discrepancies, this note is hereby submitted.

PacketCluster - 1986 CQ WW phone

Dick Newell, AK1A

This year's CQ WW phone contest saw the world's first efficient use of packet radio for multiplier spotting. This was made possible through the use of the PacketCluster software which was running at AK1A. For those of you who are not on packet yet, the PacketCluster software allows all connected stations to share multiplier spotting information, to talk to other connected stations, and to see previous multiplier announcements on a chronological and band basis.

Packet radio had been used in this year's ARRL DX contest, but stations had to be in monitor mode which meant that they had to sift through large amounts of data on their screen to pick out the multiplier announcements. PacketCluster is a giant leap forward in that stations only see multiplier announcements and other information which is actually meant for that station.

The PacketCluster software also permits several stations to run the software, thereby permitting more stations to be in the cluster. During the CQ WW contest, we had PacketCluster nodes at AK1A and K1GQ; however, RFI made the K1GQ node unreliable, so most of the users were connected to AK1A.

During the contest, we averaged about 16 connected stations. Geographically, the stations ranged from New Jersey (N2AA!) to southern New Hampshire (K1AR, NB1H, et.al.).

Now for the results! The total number of announcements made over the weekend was 839, of which 285 were dupes. This works out to be about one multiplier spotted every 3 minutes! Assuming that a station only worked what was announced on the PacketCluster, the band breakdown would be as follows:

Band	QSOs	Cs	Zs
160	23	20	8
75	104	67	19
40	85	68	23
20	145	93	36
15	120	84	30
10	77	51	19
TOTAL	554	383	135

Assuming only 2.5 points per QSO, this works out to be a little over 770K. I think that you can see how important this system can be towards our club's aggregate score.

In an attempt to see what the likely country breakdown would be if we factored in easy countries which weren't announced on PacketCluster (such as YU on 5 bands), the breakdown becomes:

Band	Countries
160	21
80	72
40	77
20	126
15	109
10	55
TOTAL	460 !!

As a matter of interest, the following "good" multipliers were announced:

Prefix	Bands	Prefix	Bands
A9	on 20	TA	on 15,20,40
AP	on 20	VP8	on 10,15,20
BY	on 20	Z2	on 10,15
CE0	on 20	ZS3	on 10,15,20
OX	on 15,40,80	UL7	on 20,40
SV	on 15,20,160	7Q	on 15

Zones missed on 20m were 2 (nobody announced a VE2), 23, 29, and 37.

Stations inputting spotting information included:

Call	Announcements	Call	Announcements
N2AA	147	W1PH	34
K1AR	114	W1YK	17
K1RQ	84	K1TR	13
N1AU	74	K1XM	8
NB1H	66	KA1X	7
W1RR	63	KA1VC	4
K1KI	61	K1GW	3
KT1O	50	KA1CI	3
K1ST	40	KM1C	2
K1GQ	37	KM1H	1

Score Rumors:

(Thanks to Randy, K5ZD/1, and the **NCJ** for providing some of this information.)

CQ WW SSB:

Call	QSOs	Zs	Cs	Score
AK1A	1575	120	340	2.0M
N1AFC (3 watts)	400	55	154	235125
W1BK (m/s)	333	75	250	215800
KM1C (+WB8BTH m/m)	1112	109	297	1.3M
K1EA	1716	120	355	2.3M
W1GG	710	85	225	610K
NB1H	1960	120	320	2.3M
K1IU	800	105	305	1.0M
K1KI	?	?	?	25192
W1PH (QRP)	537	83	218	453005
K1RQ	1805	119	381	2.6M
K1VR	1300	113	305	1.5M
K1VSJ (15M)	82	21	48	14421
W1WEF	935	99	245	909536
K1YR (+K1RU m/s)	2102	120	344	2.75M
AI3E	225	53	127	115200
K3NA	1471	117	324	1.8M
N4ZC	1980	150	483	3.3M
W5WMU	2150	137	422	3.2M
VP2V/KQ2M	3900	156	285	

W1BK ops: W1BK,WA1UAR, K1TXH

Single-Op Single Band:

Call	Band	QSOs	Zs	Cs
NQ2D	3.8	245	17	67
K7SS	3.8	800	31	92
NP4A	3.8	1160	29	105
K2EK	14	1660	38	131
KE7V	14	1420	37	122
NB1B	21	75	18	42
KA1GQW	21	360	22	83
N2IC/0	21	1441	33	121
W7WA	21	1484	33	103
K1UO	28	300	22	74
WC4E	28	350	25	76
K7QQ	28	604	19	48

Score Breakdowns:

K1AR (m/s):

band:	Qs	Zs	Cs	
1.8	17	8	13	
3.8	123	18	72	
7	130	25	81	=4.0M
14	1300	37	125	
21	526	31	121	
28	77	19	47	
TOTAL	2296	138	459	

K1CC (s/o):

band:	Qs	Zs	Cs	
1.8	28	8	17	
3.8	111	17	57	
7	81	20	58	=2.6M
14	853	36	97	
21	663	28	97	
28	91	15	45	
TOTAL	1829	124	371	

K1DG (s/o):

band:	Qs	Zs	Cs	
1.8	25	11	15	
3.8	130	18	58	
7	101	25	65	=2.5M
14	874	35	103	
21	583	28	94	
28	63	16	36	
TOTAL	1776	133	371	

KY1H:

band:	Qs	Zs	Cs	
1.8	9	5	7	
3.8	81	17	41	
7	35	14	32	=1.05M
14	528	32	87	
21	296	22	72	
28	34	14	29	
TOTAL	1033	104	268	

W1RR:

band:	Qs	Zs	Cs	
1.8	17	4	8	
3.8	41	8	27	
7	69	14	43	
14	197	30	76	
21	116	23	66	
28	49	12	24	
TOTAL	489	91	244	

K1ZM (s/o):

band:	Qs	Zs	Cs	
1.8	49	12	19	
3.8	162	18	59	
7	131	24	64	=2.7M
14	1062	37	110	
21	364	27	92	
28	91	19	42	
TOTAL	1859	137	386	

N2AA (m/m):

band:	Qs	Zs	Cs	
1.8	202	16	60	
3.8	578	22	90	
7	380	27	92	=10.9M
14	1943	39	145	
21	1620	32	134	
28	312	24	79	
TOTAL	5035	160	602	

K2TR (s/o):

band:	Qs	Zs	Cs	
1.8	33	10	19	
3.8	56	11	33	
7	92	21	54	=3.1M
14	873	33	117	
21	1164	31	111	
28	61	15	30	
TOTAL	2270	121	364	

W3LPL (m/m):

band:	Qs	Zs	Cs	
1.8	132	13	45	
3.8	397	22	79	
7	220	27	85	= 7.8M
14	1245	36	127	
21	1510	36	124	
28	620	23	90	
TOTAL	4124	157	550	

KT3M (s/o):

band:	Qs	Zs	Cs	
1.8	30	8	13	
3.8	102	15	53	
7	76	19	42	=2.9M
14	1066	36	110	
21	753	27	90	
28	83	19	49	
TOTAL	2110	124	357	

K3TUP (m/s):

band:	Qs	Zs	Cs	
1.8	34	10	18	
3.8	185	18	65	
7	110	23	75	=5.8M
14	1420	40	130	
21	1550	32	125	
28	55	21	53	
TOTAL	3354	144	466	

WX4G (s/o):

band:	Qs	Zs	Cs	
1.8	29	9	18	
3.8	124	20	60	
7	112	19	57	=2.5M
14	463	32	86	
21	818	32	108	
28	195	21	56	
TOTAL	1738	132	384	

K4ISV (s/o):

band:	Qs	Zs	Cs	
1.8	30	8	17	
3.8	57	13	33	
7	87	22	51	=2.6M
14	673	36	102	
21	829	33	107	
28	205	21	56	
TOTAL	1881	133	366	

K4VX/0 (m/s):

band:	Qs	Zs	Cs	
1.8	25	13	23	
3.8	109	20	62	
7	248	28	94	=3.7M
14	804	37	126	
21	862	33	118	
28	70	23	56	
TOTAL	2118	154	479	

N5AU (m/m):

band:	Qs	Zs	Cs	
1.8	109	15	41	
3.8	350	23	81	
7	431	28	90	=11.3M
14	1470	38	140	
21	2424	35	129	
28	610	29	81	
TOTAL	5394	168	582	

K5ZD/1 (s/o):

band:	Qs	Zs	Cs	
1.8	42	10	22	
3.8	130	16	60	
7	109	20	59	=2.7M
14	814	34	110	
21	694	30	97	
28	76	19	41	
TOTAL	1865	129	389	

AD8P (m/m):

band:	Qs	Zs	Cs	
1.8	127	15	37	
3.8	270	29	65	
7	214	26	76	=6.5M
14	1400	39	129	
21	1140	34	123	
28	365	25	73	
TOTAL	3516	168	501	

KS9K (m/s):

band:	Qs	Zs	Cs	
1.8	25	11	21	
3.8	88	15	59	
7	194	27	78	=3.0M
14	1020	39	116	
21	520	36	119	
28	70	21	54	
TOTAL	1917	149	447	

KP4BZ (m/s):

band:	Qs	Zs	Cs	
1.8	113	8	26	
3.8	327	19	63	
7	1358	30	102	=10.0M
14	1894	34	112	
21	2932	32	111	
28	626	26	61	
TOTAL	7251	149	475	

VP2EC (m/s):

band:	Qs	Zs	Cs	
1.8	196	13	36	
3.8	802	25	99	
7	1008	29	109	=12M
14	968	37	130	
21	2731	34	122	
28	962	25	52	
TOTAL	6667	163	548	

ARRL SS CW:

Call	QSOs	SECs	Score
K1DG	137	?	
KY1H (AK4L op)	833	74	
K1IU	848	?	
K1KI (3 hr)	226	58	39324
K1VSJ (A)	307	67	41138
KB1W	836	73	
W1WEF	956	74	
K1XA	919	73	134174
K1XM (A)	463	71	65746
K1ZZ	965	73	
W2GD	903	?	
N2IC	1107	74	
N2NT	1145	74	
KY2P (A)	1063	74	
W2RO	1017	74	
WA2TBA	896	72	
K3LR	1105	74	
K3SA	691	74	
WC4E (A)	725	73	
K4VX	965	74	
N5AU	1124	74	
K5GO	1131	74	
K5MM	1074	?	
K5MR	1000	74	
K5RX	1104	?	
N6TR	1102	74	
K8CC	1032	74	
WB8IXE	904	74	
W8LT	926	74	
K9KM	936	74	
K9ZO	890	74	
K0RF	1048	74	
VE1ASJ	412	74	
NP4A (K5ZD op)	1325	74	

ARRL SS SSB:

Call	QSOs	SECs	Score
AK1A	230	?	
K1AR	635	74	
N1AU	980	73	
WB1EYL (m/s)	787	72	
KC1F	3	3	
WB1GQR	1262	73	
K1IU	763	74	
K1KI	297	67	
K1RQ (WA1ZAM op)	1161	74	
K1VSJ	535	72	
K1VUT	1140	74	
W1WEF	1380	74	
W1YK	579	74	
N2IC/0	1773	74	
KQ2M	231	60	
AH2U (A)	721	74	
W3LPL (WD4AXM op)	1617	74	
WA3PWL/0	1550	74	
K3SA (A)	185	60	
KM3T	60	30	
N4KG (KC4ZV op)	1400	74	
WS4Q	1839	?	
K4VX	1628	74	
N4ZC (N5TR op)	1419	74	
N4ZZ	1499	74	
N5AU (WB5VZL op)	1628	74	
KC5CV	518	74	
KE5CV (A)	1400	74	
N5DX (K5GO op)(A)	1372	74	
W5EHM (m/s)	898	72	
K5FUV (A)	1026	71	
KM5H	172	65	
K5LZO (m/s)	1929	74	
K5RR (N5RZ op)	1556	74	
K5RVK (m/s)	1332	74	
K5RX	1544	74	
KG5U	1247	74	
K5ZD/1	1050	74	
N6BT (WA6VEF op)	1596	74	
N6BV	1803	74	
WC6H	1863	74	
NE6I	209	?	
AI6V	1600	74	
KC7V	971	74	
W7WA	1656	74	
KA8HFO	972	70	
WB8JBM (m/s)	1682	74	
W8LNO (m/s)	1223	74	
W8LT (WD8IXE op)	1230	74	
KQ8M (A)	748	73	
W8SH (m/s)	1230	74	
WB9HAD	1436	74	
WB9JKI (A)	593	74	
W9OBF (A)	770	70	
K9ZO	1190	74	
W0AIH (m/s)	1258	74	
W0CEM (m/s)	1548	74	
K0DD	1702	74	
W0EJ	1883	74	
WB0IKN (A)	925	74	
KM0L (A)	680	74	
W0PSY	1072	74	
K0UK (m/s)	1632	74	

Movers and Shakers

Update your club roster to indicate these changes:

Ed Kritsky, ex-KA2MXO, is now NT2X.

John Allen, K1FWF, has a new work phone number: (617)870-9856. You can also reach him at his old work number.

New Crew

Please welcome the following new members, who joined at the Boxboro Convention:

Mac McGrath, KZ1A
47 Lakeview Drive
Narragansett, RI 02882
home phone: (401)789-1796
work phone: (203)666-1541 x 202

Shawn McCormick, NC1B
P. O. Box 17
Feeding Hills, MA 01030
home phone: (413)786-7966

Bruce Blain, K1BG
34 Bancroft Street
Pepperell, MA 01463
home phone: (617)433-6363
work phone: (617)263-9449
Also holds callsign G4WJQ.

Lester Kemble, KG1D
14 Grandview Terrace
Vernon, CT 06066
home phone:(203)872-3099
work phone: (203)566-4794

James R. Henderson, N1DEA
Giles Road
Lincoln, MA 01773
home phone: (617)259-8738

Lawrence D. Savoy, KX1F
51 Pine Hill Road
Springfield, MA 01118
home phone: (413)783-7786
work phone: (203)674-3894

Robert B. Weinstock, KN1K
26 Sewell Street
Framingham, MA 01701
home phone: (617)620-1747

Bob McCormick, KA1KPH
P. O. Box 17
Feeding Hills, MA 01030
home phone: (413)786-7966
work phone: (413)737-0295

John F. Corini, KA1MDG
22 Laurel Drive
Bolton, MA 01746
home phone: (617)779-5424

Steve Tolf, K1ST
RFD 1 - Box 176A
Exeter, NH 03833
home phone: (603)772-6131

Michael McCarthy, WA1UAR
91 Dunstable Road,
P. O. Box 3155
Westford, MA 01886
home phone: (617)692-3525
work phone: (617)263-9929

George Smith, KA1VC
198 Rainbow Trail
Vernon, CT 06066
home phone: (203)872-1440

Robert Halprin, K1XA
P. O. Box 624
Newington, CT 06111
work phone: (203)666-1541

Bob Shaw, WA2CNF
14 Fenno Drive
Westminster, MA 01473
home phone: (617)874-2856
work phone: (617)343-1441

Rus Healy, NJ2L
225 Main Street
Newington, CT 06111
home phone: (203)225-0387
work phone: (203)666-1541

Gerry Hull, AK4L
RFD 5 Box 328
Gilford, NH 03246
home phone: (603)293-4911
work phone: (603)228-2340
Also holds callsign VE1RM.

Excess Cargo

Ameritron AL-1200 $1095. Call Ron, K1BW, at (203)848-3796.

The **Scuttlebutt** is the newsletter of the **Yankee Clipper Contest Club** and is mailed six times per year to all paid up members. Dues are $10 per year, payable 1 April with a grace period through 30 June. Non-members may subscribe to the **Scuttlebutt** by sending $10 to the Treasurer: Charlotte Richardson, KQ1F, 11 Michigan Drive, Hudson, MA 01749. Subscribers who subsequently become members will be credited as having paid dues.

The **Yankee Clipper Contest Club** (an ARRL Affiliated Club) holds six official meetings per year, on the Saturday or Sunday afternoon of the first full weekend of every even month in the Sturbridge, Massachusetts, area. The deadline for article submission to the **Scuttlebutt** is three weeks before the next meeting date. The next meeting will be on Sunday, December 7, 1986, in Sturbridge, Massachusetts. Attendance at an official meeting is *required* in order to become a member. Club members congregate on 3830 Khz or 1900 Khz Monday evenings; many routinely monitor these frequencies other evenings as well.

Rosters are mailed to all paid members each summer. For more information and/or assistance, contact the area manager nearest you on the following list:

Area	Call	Name	Home	Work
CT/RI	K1RX	Mark Pride	(203) 271-2076	(203) 265-8825
EMass	W1FJ	Al Rousseau	(617) 598-3744	(617) 599-7500 x 173
WMass	KY1H	Dave Robbins	(413) 655-2714	(413) 494-5618
VT/NH	KM1C	Bill Pedersen	(603) 673-1678	
ME	K1SA	Bernie Cohen	(207) 773-6589	(207) 797-3585
NNY	K2RD	Ira Stoler	(518) 439-5804	(518) 445-8474
SNY/NJ	K2EK	Bill Gioia	(914) 221-1672	(212) 888-2102

YCCC
11 Michigan Drive
Hudson MA 01749

FIRST CLASS